

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
3 June 2004 (03.06.2004)

PCT

(10) International Publication Number  
**WO 2004/046023 A3**

(51) International Patent Classification<sup>7</sup>: **H01L 21/20**,  
29/06

(74) Agents: TUMEY, Tod, T. et al.; Conley Rose, P. C., P. O.  
Box 3267, Houston, TX 77253-3267 (US).

(21) International Application Number:  
PCT/US2003/037188

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,  
AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR,  
CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD,  
GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,  
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN,  
MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU,  
SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA,  
UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(22) International Filing Date:  
19 November 2003 (19.11.2003)

(25) Filing Language: English

(26) Publication Language: English

(84) Designated States (*regional*): ARIPO patent (BW, GH,  
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),  
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,  
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,  
SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA,  
GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(30) Priority Data:  
60/427,533 19 November 2002 (19.11.2002) US

(71) Applicant (*for all designated States except US*):  
**WILLIAM MARSH RICE UNIVERSITY** [US/US];  
6100 South Main, Houston, TX 77251-1892 (US).

**Published:**  
— *with international search report*

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **BARRON, Andrew,**  
**R.** [GB/US]; 241 Asbury, Houston, TX 77007 (US).  
**FLOOD, Dennis, J.** [US/US]; 161 Forest Street, Oberlin,  
OH 44074 (US). **LOSCUTOVA, John, Ryan** [US/US];  
1707 Vassar, Houston, TX 77098 (US).

(88) Date of publication of the international search report:  
10 March 2005

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

(54) Title: FABRICATION OF LIGHT EMITTING FILM COATED FULLERENES AND THEIR APPLICATION FOR IN-VIVO LIGHT EMISSION

(57) Abstract: A nanoparticle coated with a semiconducting material and a method for making the same. In one embodiment, the method comprises making a semiconductor coated nanoparticle comprising a layer of at least one semiconducting material covering at least a portion of at least one surface of a nanoparticle, comprising: (A) dispersing the nanoparticle under suitable conditions to provide a dispersed nanoparticle; and (B) depositing at least one semiconducting material under suitable conditions onto at least one surface of the dispersed nanoparticle to produce the semiconductor coated nanoparticle. In other embodiments, the nanoparticle comprises a fullerene. Further embodiments include the semiconducting material comprising CdS or CdSe.



WO 2004/046023 A3

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/37188

## A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : HOIL 21/20; HOIL29/06  
US CL : 438/479;16, 22,57; 427/402,407.1; 428/402; 257/13

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 438/479;16, 22,57; 427/402,407.1; 428/402; 257/13

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
WEST

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P --- A,P	US 2003/0034486A (KORGEL) 20 FEBRUARY 2003 (20.02.2003), paragraphs (0094, 009500105,0108,0145,0185,01980201,0225,0226)	1-9,14-18,20-27 ----- 10-13,19
Y	US 6,126,740 A (SCHULTZ et al) 03 OCTOBER 2000(10.03.2004) see summary of the invention	1, 5-9,14-18,20, 24-27
Y	US 6,277,766 A(AYERS) 21 AUGUST 2001(8.21.2001) abstract, col. 8, example	1-9,14-18, 20-27
Y,E	US 6,685,986 A(OLDENBURG et al) 03 FEBRUARY 2004(03.02.2004) see abstract, col.7, lines 55-67)col.11, lines 37-55, example VIII	1-18, 20-27
Y,E	US 2004/0108298 A (GAO)10 JUNE 2004(10.06.2004) see abstract, paragraph 0004, summary of invention	1-9, 14, 17, 20-27
A,E	US 6.710,366A (LEE et al) 23 MARCH 2004(23.03.2004) see abstract, summary of the invention	1-27
Y	6,348,295 A (GRIFFITH et al) 19 FEBRUARY 2002(19.02.2004) see abstract and summary of the invention	1--9,14-18, 20-27

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

21 September 2004 (21.09.2004)

Date of mailing of the international search report

21 DEC 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

Facsimile No. (703)305-3230

Authorized officer

Savitri Mulpuri

Telephone No. 571-272-1677